Joint Studies for Flow Apportionment

APPENDIX A:
EXISTING AND HISTORICAL SURFACE WATER USE

Report of the International Souris-Red Rivers Engineering Board, Poplar River Task Force

JANUARY 1976

IOINT STUDIES

FOR

FLOW APPORTIONMENT

POPLAR RIVER BASIN

MONTANA - SASKATCHEWAN

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REPORT OF THE INTERNATIONAL SOURIS-RED RIVERS

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At the request of the [illegible], the Saskatchewan Department of Environment and the Montana Department of [illegible] and Conservation have carried out studies of existing (1975) and historical (1931-1974) water use in their respective portions of the Poplar River Basin.

Based on field inspections, project-owner interviews, and hydrologic analyses existing and historical uses were estimated. In Saskatchewan the historical use has varied from a minimum of zero acre-feet in 1932 and 1933 to a maximum of 3,790 acre-feet in 1968. In an average evaporation year at the 1975 level of development, the existing use is estimated to be 1,560 acre-feet. In Montana, the historical surface water use has varied from a minimum of 1,601 acre-feet in 1934 to a maximum of 8,590 acre-feet in 1972. Existing uses at the 1975 level of development are estimated to be 8,750 acre-feet per year.

ACKNOWLEDGMENTS

The assistance of office and field staff of the Saskatchewan Department of the Environment, the Prairie Farm Rehabilitation Administration of the Department of Regional and Economic Expansion, the Daniels County Agricultural Stabilization and Conservation Service and the Soil Conservation Service of the U.S. Department of Agriculture, the Bureau of Reclamation of the U.S. Department of Interior, and the Montana Department of Natural Resources and Conservation in carrying out this study is gratefully acknowledged. We also acknowledge and appreciate the participation of the Fort Peck Sioux and Assiniboine Tribes. On behalf of the Tribes, the U.S. Bureau of Indian Affairs and a private consulting firm, Morrison-Maierle, Inc., have prepared the water use data within the boundaries of the Fort Peck Indian Reservation.

APPENDIX A

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I. INTRODUCTION

The Poplar River Task Force was established by the International Souris-Red Rivers Engineering Board in April, 1975. The objective of the Task Force is to prepare recommendations on:

1. An equitable apportionment at the international boundary of the flows of the Poplar River Basin,

2. A method of calculation of natural flows in the Poplar River Basin at the international boundary, and

3. The membership, and terms of reference for, an international group to administer an apportionment agreement.

The terms of reference for the Task Force call for a study to determine existing and historical uses in the basin in both Canada and the United States. The objective of this study was to determine the existing (1975) and historical (1931 to 1974) surface-water use in the Poplar River Basin in Saskatchewan and Montana. The Montana Department of Natural Resources and Conservation was designated the lead agency for carrying out this study in Montana. The Saskatchewan Department of the Environment was the designated lead agency for the study in Saskatchewan. Close liaison was maintained between these two agencies so that, insofar as possible, similar methods for determining existing and historical uses were used.

Study approaches and procedures are outlined in the second chapter of this report. Criteria and assumptions used in the study are discussed in the third chapter. The results are recorded in the fourth chapter. The fifth chapter includes a discussion of methodology, the relationship between water use and water rights, and the use of the stream for fisheries.

II. APPROACH

In general, the study approach in Saskatchewan followed normal procedures used by the Water Rights Branch in periodically updating their project files. These procedures include (1) a review of existing information on file, (2) an inspection of aerial photographs, (3) a field inspection and owner interview, and (4) an office follow-up. Some modifications of the normal procedures were made to obtain more accurate information from the project owner on historical water use. These are discussed in Chapter III.

In Montana, water use information could not be obtained by tabulating the amount of water applied for by water right filing or application. Prior to July 1, 1973, water rights were recorded by filing in the County Clerk and Recorder's Office. No standard water measurement was specified for use in filing, therefore rights were filed for many different units (miners inches, cubic feet persecond, gallons per minute, or acre-feet). The water right applicant generally had no knowledge of the number or amount of previous filings. These differences can only be resolved by adjudication in the court. The Poplar River has not yet been adjudicated under Montana Water Use Act of 1973. Dates of individual filed water rights were obtained and reviewed to determine which rights are still active.

Information describing individual water projects was prepared from (1) previous field survey data on file with the Montana Division of Water Resources related to irrigation, (2) field inspection and owner telephone interviews to update the owner field surveys, (3) inspection of aerial photographs to locate and size irrigation and stock ponds, and (4) county livestock census data. Similar methods were applied in all parts of the Montana portion of the Poplar River Basin including the Fort Peck Indian Reservation.

Where possible, similar methods of determining existing and historical use were applied by both Saskatchewan and Montana. The major difference in available data was the existence of more complete files describing project features and construction dates in Saskatchewan as compared with Montana.

Saskatchewan

The Water Rights Branch have on file 161 projects in the Poplar River Basin. Each project file was reviewed to determine the general history of project. Plans on each project so filed, were obtained for use during the field inspection.

All projects were located on 1:80,000 scale 1970 aerial photographs. The general size, layout, and access to each project were noted. A total of 120 unregistered projects were located in addition to the 161 registered projects.

All 281 projects were located and plotted on 1:50,000 scale and 1:250,000 scale National Topographic Series maps. This was done to facilitate field logistics.

All projects were inspected in the field to determine the size and condition of the project and to ensure that registered projects conformed to plans. Owners of all the large projects and most small projects were interviewed to determine past and present water use and future plans for the project.

Standard inspection forms were used to guide the project inspection and owner interviews. Tables A-1 and A-2 are the forms used for storage and irrigation project inspections. One and sometimes both of these forms were completed for each project inspected.

Field information was compiled and analyzed. Present and historical water use for the 1931 to 1974 period was estimated from the project histories, field inspections, and owner interviews information. Water use by the Village of Coronach was obtained from their pumping records.

Montana

In Montana, the first step in determining irrigation water use was review of surveys conducted by the Montana Water Resources Board in Valley County (1968), and Daniels County (1969 to 1970, unpublished), and in Roosevelt County (1970, unpublished). The Water Resources surveys information on water right filing dates was then updated by review of filings in the County Clerk and Recorder's Office. These filing dates were assumed in many cases as the starting date for irrigation use.

Field inspection and checking were used to verify and update project size and location. Owner interviews were used to determine the irrigated acreage, the type of irrigation system used, and the years of operation. A telephone survey of each owner was used to obtain historical changes in acreage irrigated. The town of Scobey was contacted to determine their water use. An inventory on file in the Bureau of Indian Affairs Office in Poplar, Montana, was researched for project locations on the Fort Peck Indian Reservation.

The aerial photographs used in the water resources surveys were used in this study and were updated to show 1975 development. These aerial photographs have a scale of 3.2 inches per mile for Valley County, 4 inches per mile for Daniels County, and 4 inches per mile in Roosevelt County. Locations of all reservoirs were determined by use of aerial photographs. The reservoir locations were recorded by subbasin, section, township, and range.

Table A-1

INSPECTION SHEET WATER STORAGE PROJECTS

Drainage Basin _____ File No._____ Map No. _____

Diversion Point _____ Source of Supply _____

Project Name _____

Present Operator _____ Address _____

Operater's Interest in Land: Owner _____ Renter _____ Other _____

Status of Project: Licenced _____ Authorized _____ Renter _____ Other _____

Allocation:_____ acre-feet Capacity:_____ acre-feet

Type of Dam: Earth _____ Rockweir _____ Timber _____ Other _____

Top Width _____ ft. Height _____ ft.

Side Slopes: Upstream _____ Grassed _____ Rock Rip Rap _____ Other _____

Side Slopes: Downstream _____ Grassed _____ Rock Rip Rap _____ Other _____

Downstream Seepage: Yes _____ No _____

Wave Action Erosion: No _____ Yes _____ Extent _____

Spillway: Natural _____ Cut _____ Rock Rip Rap _____ Grass _____ Other _____

Eroded: No _____ Yes _____ Explain: _____

Reservoir: Permeable _____ Impermeable _____

Excavation in Reservoir Area: No _____ Yes _____ Dimensions _____

Condition of Reservoir: Silted _____ Growth _____

Reservoir Elevation at Time of Inspection _____ feet below F.S.L.

Reservoir Elevation before Spring Runoff _____ feet below F.S.L.

Reservoir Elevation after Spring Runoff _____ feet below F.S.L.

Use: Summer Use _____ Year-round _____

Garden Irrigation: No _____ Yes _____ Area _____

Livestock: No _____ Yes _____ Average Number of Livestock _____

Household Purposes: Yes _____ No _____

Other (specify) _____

Outlet Structure: No _____ Yes _____ CMP _____ Wood _____ Other _____

Condition: Good _____ Fair _____ Poor _____

Control Gate: Calco Metal _____ Wood _____ Home Made _____ Other _____

Water Supply:

First Year Water was Stored _____

Reservoir Spills Every Year _____ Most Years _____ Rarely _____ Never _____

Reservoir was empty _____ years out of _____ years.

Is water supply adequate _____ inadequate _____?

Does owner or operator plan any improvements which may require more water within the next three years? Explain _____

_____

ten years? Explain _____

_____

Condition of Project: Good _____ Fair _____ Poor _____

Project Conforms to Plan: Yes _____ No _____

REMARKS:

_____ _____

Date of Inspection Inspecting Officer

Table A-2

INSPECTION SHEET IRRIGATION P.O. [illegible]

I Drainage basin_____ File No._____ Map No._____

Diversion point_____ Source of supply_____

Project name_____ Year project went into production_____

Present Operator_____ Address_____

Operators interest in land, owner_____ renter_____ other_____

Status of project licensed_____ authorized_____ application_____ illegal_____

Allocation_____ ac. ft. Irrigable area _____ acres

SPRINKLER SYSTEMS

II Pump_____
(make, model number, type (centrifugal or reciprocating) inlet & outlet diameter)

Motor_____
(make, type, brake hp rating type of energy used, rpms)

Pipe_____
(total lengths and diameters, whether aluminum, steel, plastic)

Sprinklers_____
(brand name and model, number used, size of outlet ex: 3/16"x1/8")

Operation time_____
(number of sets and the hours per set)

BACKFLOOD SYSTEMS AND OR BORDER DYKE SYSTEMS

III Dyke: Top width_____ ft. height_____ ft. minimum

Side slopes upstream_____:1 grassed_____ rip-rapped_____ other_____

downstream_____:1 grassed_____ rip-rapped_____ other_____

Spillway: Natural_____ cut_____ rip-rapped_____ other_____

Eroded No_____ Yes_____ explain if yes_____

F.S.L. raised_____ lowered_____ as shown on plan_____

Outlet structure: cmp_____ wood_____ other_____

Condition good_____ fair_____ poor_____

Control gate metal_____ wood_____ other_____

IV Water use: Year of Inspection

Is project operable_____ inoperable_____

Elevation of w.l. after spring runoff _____ above f.s.l._____ below f.s.l._____

Acres irrigated_____

Project History

Irrigated area: maximum acres_____ average acres_____ minimum acres_____

Complete coverage_____ years out of_____ years

Average acreage_____ years out of_____ years

Minimum acreage_____ years out of_____ years

Table A-2 (continued)

Area irrigated	water used (any information on years prior, please include in remarks on page 2)
1974_____	_____
1973_____	_____
1972_____	_____
1971_____	_____
1970_____	_____

Type of crop irrigated_____ average yield_____

Owners or operators evaluation of project.

Satisfactory_____

Unsatisfactory_____

Why_____

_____

Plans for future water use based on potential of operational expansion

- plans within next three years_____

_____

_____

- plans within next ten years_____

_____

_____

V Is the project in the contributing area of the basin Yes_____ No_____

Condition of project good_____ fair_____ poor_____

Project conforms to plan Yes_____ No_____

Pertinent remarks:

Date of Inspection_____ Inspecting Officer _____

Data obtained by all sources were compiled and checked to verify water use for irrigation, domestic, and municipal projects. Estimates of historical use and trends were then determined from the various sources of information.

III. ASSUMPTIONS AND CRITERIA

Several basic assumptions were made and criteria established for estimating water use from: (1) information gathered in the field, (2) data on file, and (3) published and unpublished sources. As previously stated, efforts were closely coordinated between the Montana and Saskatchewan agencies so the assumptions and criteria were similar for the most part.

Irrigation Water Use

In Saskatchewan, water use for irrigation was estimated from: (1) project owners' records of pumping rates and time, (2) depth over a flooded area, and (3) irrigated acreage and estimated duty 1/ of water. The major crop irrigated in Saskatchewan is grass for use as pasture or hay.

Estimates of water use for irrigation in Montana were based on: (1) the type of irrigated crop (alfalfa or alfalfa-grass mixture for hay), (2) general soil type, (3) type of irrigation, and (4) pumping or diversion records when available.

The two types of irrigation practiced in the basin are backflood or spreader dike systems which are used primarily on small tributaries and pumping or gravity diversion from a stream with a sprinkler or flood application.

Spreader Dike Systems

Spreader dike systems usually receive one spring runoff irrigation. These systems are generally designed to receive 12 inches of water. An eight inch duty was used for spreader dike systems (back flood project) in Saskatchewan. In Montana a 10 inch duty was used. The frozen ground, (a normal condition during spring runoff) in addition to some natural moisture in the soil, will allow only about 10 inches of water for plant consumption, evaporation, and other losses.

1/ In this report the term "duty" refers to the estimated depth of water used to irrigate a parcel of land.

In Saskatchewan, a 12 or 18 inch duty was used for a sprinkler application system unless owner records were available. A 12-inch duty was used for most projects. However, if the project had sufficient available storage an 18-inch duty was used. Evaporation from irrigation storage projects is discussed in another section of this chapter.

In Montana, irrigation estimates were based on soils characteristics, irrigation timing and availability, and low flow and associated salinity problems.

Soils

The Irrigation Guide for Montana (Soil Conservation Service 1974) was used for determining the total water-holding capacity which is 10 inches for the deep loam soil type predominant in the area. In general, the soil needs irrigating at about 50 percent of the total water-holding capacity; therefore, 5 inches is the net irrigation requirement. The assumption that a field efficiency of 65 percent is applicable to the Poplar River Basin was made after field observation of some irrigation systems. Therefore, the gross irrigation depletion is 7.69 inches or 0.64 acre-feet.

Water Availability

The water availability was analyzed by months, based on stream-gauging records for the Middle Fork Poplar River and East Fork Poplar River at the international boundary. The number of water applications for each year was determined by considering the number of months that water was available for irrigation as per the following: (1) March through April - one irrigation, (2) March through May - two irrigations, (3) March through June - three irrigations, and (4) March through July - four irrigations.

Low Flow and Associated Salinity Problems

Even though water may be available, irrigation during the late summer during the low flow periods is discouraged. The salinity content of the Poplar River basin water approaches an amount too high for the type of soil prevalent in the stream valleys. A water analysis study in the 1960's showed high salinity content in the streams during low flows in the summer months. The results of this study prompted the Soil Conservation Service and County Extension personnel to discourage late season irrigation. Recent water data collected during water year 1975 indicate that the water quality does deteriorate during the low

flow periods. Unusually high boron concentrations,which are detrimental to irrigation, have been measured.

Domestic Use

Domestic use includes water needed for livestock, household and garden irrigation needs. Household and garden irrigation needs were assumed to be insignificant in the basin. Livestock use of surface water is the only significant domestic use.

Water use for livestock is based upon one acre-foot for every 50 head of cattle. This value is used in both Saskatchewan and Montana and is standard criteria used by the Water Rights Branch of Saskatchewan Department of the Environment. Cattle are the predominant livestock. Water use by sheep, poultry, horses and other types of livestock was considered small, and no attempt was made to quantify those uses by either Saskatchewan or Montana.

Existing and historical numbers of livestock in the Saskatchewan portion of the basin were obtained from owner interviews and from information obtained from water right files.

In Montana, livestock (cattle and calves) numbers were determined from county agricultural census data which is published by the Montana Crop and Livestock Reporting Service (1946 to 1972). A number of factors were considered to adjust the county livestock data to the Poplar River Basin and estimate water use.

1. Even distribution of cattle throughout the basin.
2. Six percent of Valley County; 78% of Daniels County; and 29% of Roosevelt County lie in the basin.
3. Numbers of cattle and calves in the counties were taken from the Montana Agricultural Statistics for the period 1940 through 1974 and a State chart of cattle population trends was used for estimating numbers during the period 1930 to 1940.

Municipal Use

Since 1964 a well adjacent to the Coronach Reservoir has been the source of water supply for the Village of Coronach, Saskatchewan. The well is situated in a sand and gravel aquifer at 35 to 48 feet below the surface. Pump tests have indicated an abnormally high yield for an aquifer in this particular type of strata. Recharge from the adjacent reservoir is believed to be responsible for the high yield.

Water use by the village has ranged from about 20 to 40 acre-feet per year since 1964. Based on drawdown computations, it was

estimated that about 90 percent of the annual use since 1964 represents a depletion of surface water. Since this is relatively insignificant in terms of the total use in the basin, it was felt that further investigations to firm up the contribution from the reservoir were not warranted.

Scobey, Montana owns the only municipal project in the Montana portion of the basin. A system of wells in the alluvium adjacent to the Poplar River is the source of the water. Water in the alluvium is recharged by the Poplar River. Average annual use for the period 1968-74 was 272 acre-feet per year.

Reservoir Evaporation

A number of reservoirs have been developed in the basin for irrigation and domestic needs. The major use of the water from these reservoirs is for livestock needs.

On small reservoirs in the basin that are expected to fill and spill every year, evaporation loss was approximated based on the formula,

$$E = 0.6\ Ae$$

where E is total evaporation for all small reservoirs in acre feet, A is the total surface area of all small reservoirs at their full supply levels in acres, and e is the annual evaporation from open water surfaces in feet. The factor 0.6 accounts for the decreased surface area due to drawdown of the reservoirs during the main evaporation season.

The factor 0.6 was obtained by more detailed evaporation computations on a few typical small reservoirs in the Saskatchewan portion of the basin. It was found that the average surface area for the main evaporation season was about 60 percent of the surface area at full supply level.

The procedures followed in determining net evaporation and surface areas in Saskatchewan and Montana differed. A discussion of these procedures follows.

Saskatchewan

Net evaporation from open water surfaces in the Poplar River Basin in Saskatchewan for the period 1931 to 1974 was estimated based upon procedures outlined in the Saskatchewan-Nelson Basin Board report on Hydrology (Saskatchewan-Nelson Basin Board, 1972). In brief, annual gross evaporation at Regina, determined using Meyer's equation, was adjusted to the Poplar River Basin based upon the ratio of mean annual gross evaporation in the Poplar River Basin to mean annual gross evaporation at Regina. These values were obtained from a map showing isopleths

of mean annual gross evaporation (Prairie Provinces Water Board, 1952).

Annual net evaporation in the Poplar River Basin was computed as the difference between gross evaporation and precipitation in the basin. Precipitation records gathered near Coronach were assumed to be representative of precipitation over the basin. Net evaporation in the basin ranged from 1.0 feet to 3.4 feet with a mean of 2.1 feet.

The surface area at full supply for all small reservoirs in the basin was obtained from plans on Water Rights Branch files for registered projects. Surface area was estimated in the field for projects not registered.

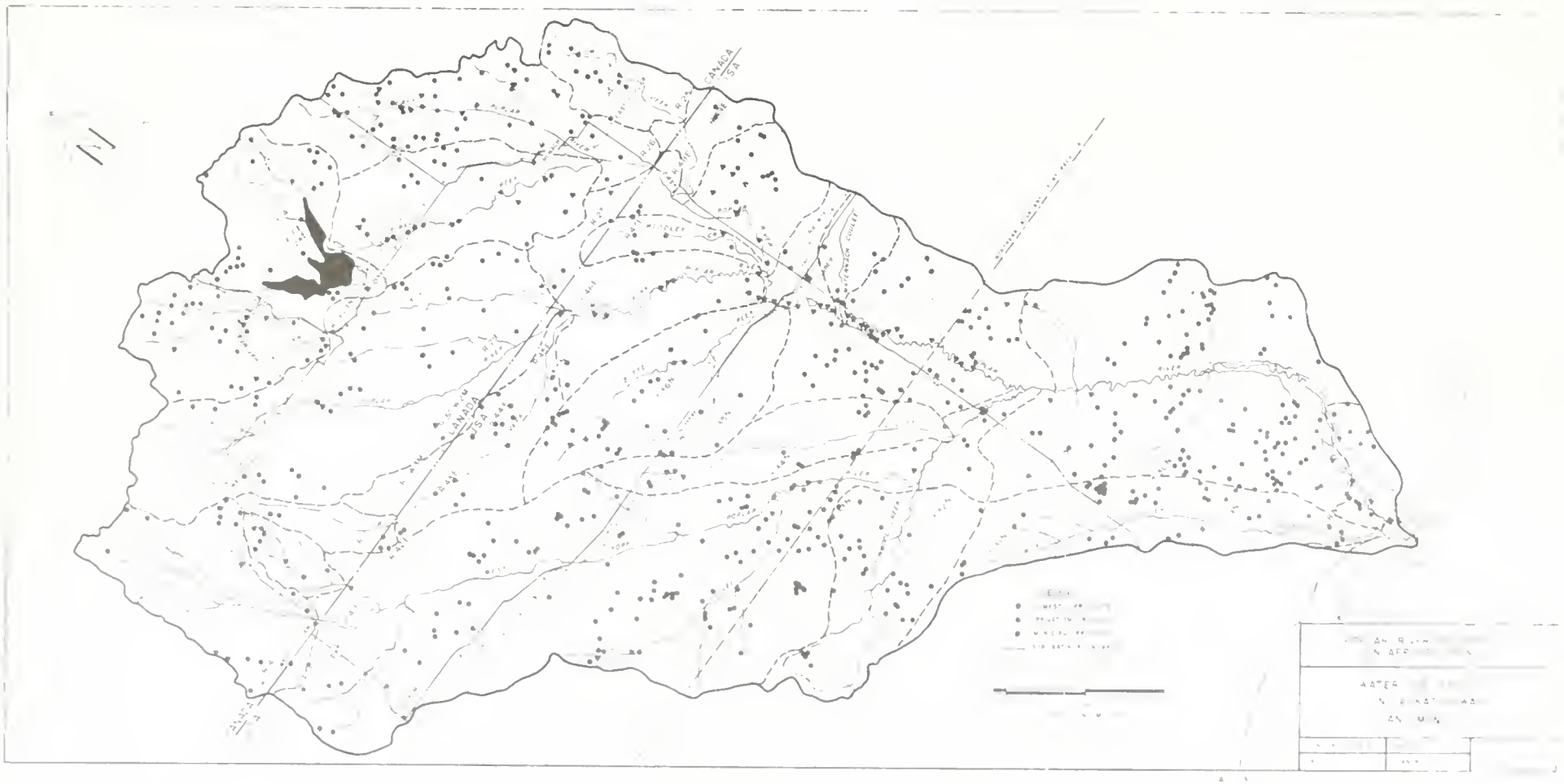
On large reservoirs, where the assumption that the reservoir fills and spills every year is probably not valid, evaporation was determined from an annual water balance study. There are three reservoirs of this type in the basin, namely:

1. Clark Bridge Reservoir, originally 960 acre-feet, now 275 acre-feet.
2. Coronach Reservoir - 585 acre-feet.
3. West Poplar Reservoir - 960 acre-feet.

The locations of these three large reservoirs are shown on Figure 1. Also, a control structure has increased the level of Fife Lake resulting in higher evaporation. At the request of Saskatchewan Department of the Environment, the Hydrology Division of Prairie Farm Rehabilitation Administration carried out the water balance studies on these three reservoirs and Fife Lake. It was felt that it would be more appropriate for that agency to undertake the studies since they would be working with drainage areas and streamflows during the course of the natural flow study component of the Task Force assignment for which they are responsible. The water balance studies were carried out using the same net evaporation figures as were used to compute evaporation from the small reservoirs.

Montana

For the portion of the basin outside the Fort Peck Indian Reservation, net evaporation from open water surfaces in the Poplar River Basin in Montana, for the period 1931 to 1974, was estimated based upon procedures outlined in the Missouri River Comprehensive Framework Report (Missouri River Basin InterAgency Committee, 1969). In brief, annual gross evaporation at Fort Peck Reservoir, was adjusted to the Poplar River Basin based upon the ratio of mean annual gross evaporation in the Poplar River Basin to mean annual gross evaporation at Fort Peck Reservoir. These values were obtained from the Missouri Framework Report from a map showing isopleths of mean annual gross evaporation.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Annual net evaporation in the Poplar River Basin was computed as the difference between gross evaporation and precipitation in the basin. Average annual net evaporation for the basin is 2.16 feet. This value was used in determining evaporation on the Fort Peck Indian Reservation each year.

For the purpose of evaporation computations, it was assumed that all reservoirs in Montana would fill and spill every year. In Valley and Daniels Counties the use of water from reservoirs is not significant and the historic record is very difficult to obtain. Only the reservoirs mapped on the Water Resources Surveys' aerial photographs were included in the existing use study. The surface area at full supply level for all small reservoirs in this portion of the basin was obtained by arriving at an average size for reservoirs with in the sub-basins. The reservoir count for each sub-basin was recorded by section, township and range. A significant number of each sub-basin reservoirs were planimetered for size of surface area. The surface measurements were averaged and the average surface size was multiplied by the total number of reservoirs within a sub-basin to obtain the total surface water area in acres for the sub-basin.

In Roosevelt County (Fort Peck Indian Reservation), an inventory of reservoirs was prepared from 1967 aerial photos. Eighty percent of the area was scanned to locate reservoirs. Within this area the surface acreage of each reservoir was measured using a transparent grid of 1-acre squares. The total surface acreage thus determined was proportionally adjusted to account for 100% of the Poplar River Watershed within the Fort Peck Indian Reservation. Bureau of Indian Affairs' files were examined to determine the historic trend of reservoir construction.

IV. RESULTS

Water use in the basin was tabulated in sub-basin components to facilitate the natural flow study Sector Report. Natural flow will be reconstructed for the period 1931 to 1974 for several rivers and tributaries crossing the international boundary. The sub-basins for which water use was determined are:

1. Cow Creek to international boundary.
2. East Poplar River to international boundary (excluding Girard Creek).
3. Girard Creek to the mouth (excluding Fife Lake).
4. Fife Lake
5. Poplar River to international boundary.
6. Coal Creek to international boundary.
7. East tributary of West Poplar River to international boundary.
8. West Poplar River to international boundary.
9. Other tributaries crossing the international boundary.
10. Cow Creek from the international boundary to its confluence with the East Poplar River.
11. East Poplar River from the international boundary to its confluence with the Middle Fork Poplar River.
12. Woodley Creek to the mouth.
13. Middle Fork Poplar River from the international boundary to its confluence with the East Poplar River (except for Coal Creek).
14. Coal Creek from the international boundary to the mouth.
15. West Fork Poplar River from the international boundary and to the Fort Peck Indian Reservation.
16. Poplar River from the confluences of Middle Fork and East Poplar River to the Fort Peck Indian Reservation (except for Butte Creek and Manternach Coulee).
17. Butte Creek to the mouth.
18. Manternach Coulee to the mouth.
19. Police Coulee to the Fort Peck Indian Reservation.
20. Poplar River from reservation boundary to West Fork Poplar River.
21. West Fork Poplar River from the reservation boundary to the mouth.
22. Cottonwood Creek.
23. Police Coulee from the reservation boundary to the mouth.
24. Poplar River from West Fork Poplar River to the USGS gauge No. 6-1810 (Poplar River near Poplar).
25. Poplar River USGS gauge No. 6-1810 to the mouth.
26. Box Elder Creek.

Water Use in Saskatchewan

A total of 225 projects in the Saskatchewan portion of the basin that have a significant existing or historical water use were identified. The locations of these projects are shown on Figure 1.

The number and type of projects in each of the sub-basins is shown in Table A-3. It should be recognized in this and subsequent tables showing sub-basin information, that Girard Creek is in the effective drainage area of the East Poplar River and Fife Lake is in the gross drainage area of Girard Creek and East Poplar River. They are listed separately in these tables.

Water use in the basin varies annually because of the variable evaporation demand and the number of projects in operation. At the 1975 level of development, the total demand in the basin would be about 1560 acre-feet in an average evaporation year. Water use in the various sub-basins at the 1975 level of development and for an average evaporation year is summarized in Table A-4.

Historical water use in the basin for the period 1931 to 1974 is given in Table A-5. Use varies from a minimum of nine acre-feet in the years 1932 and 1933 to a maximum of 3790 acre-feet in year 1958. Summaries of historical water use in the various sub-basins are given in Table A-9 through A-17 of Attachment A-1. It is important to note that, in this basin, when water is used or evaporated from a storage reservoir, there is a resultant depletion to surface runoff in the following year when the reservoir is refilled. For this reason, water use for sprinkler irrigation systems, where storage is required, is tabulated separately from spring flood irrigation use which generally does not require storage.

Table A-3

NUMBER AND TYPES OF PROJECTS - SASKATCHEWAN

Sub-basin	Number of Projects			
	Domestic	Irrigation	Municipal	Total
1. Cow Creek	10	2	0	12
2. East Poplar River	43	11	0	54
3. Girard Creek	20	7	1	28
4. Fife Lake	48	11	0	59
5. Poplar River	38	3	0	41
6. Coal Creek	2	0	0	2
7. East Tributary of West Poplar River	6	2	0	8
8. West Poplar River	14	3	0	17
9. Other Tributaries	3	1	0	4
Totals	184	40	1	225

Table A-4

EXISTING WATER USE - SASKATCHEWAN
(acre-feet/year)

Sub-basin	Domestic		Irrigation		Municipal	Mean Evap. on Large Reservoirs	Total
	Use	Evap.	Use	Evap.			
1. Cow Creek	8	14	0	0	0	0	22
2. East Poplar River	24	81	61	0	0	150	316
3. Girard Creek	20	110	40	45	36	240	491
4. Fife Lake	51	63	64	12	0	0*	195
5. Poplar River	48	78	52	0	0	0	178
6. Coal Creek	5	5	0	0	0	0	10
7. East Tributary of West Poplar River	8	2	13	0	0	0	23
8. West Poplar River	16	20	12	0	0	230	278
9. Other Tributaries	2	24	20	0	0	0	46
Totals	182	402	262	57	36	620	1559

* Existing uses in the Fife Lake basin have offset the effect of the control on Fife Lake and the lake has been close to its natural level in recent years.

Table A-3

HISTORICAL WATER USE - SASKATCHEWAN
(acre-feet)

Year	Domestic Projects Use	Domestic Projects Evap.	Irrigation Projects Use Back flood	Irrigation Projects Use Sprinkler or Gravity	Irrigation Projects Evap.	Municipal Water Use	Evap. from Large Reservoirs	Total
1931	2	9						11
1932	2	7						9
1933	2	7						9
1934	2	12						14
1935	8	9	22		1			40
1936	13	27	16		3		-12	47
1937	30	100	16		2		-36	120
1938	37	77	18		2		-6	130
1939	42	70	18		16		-18	220
1940	49	130	18		12		-18	200
1941	53	140	18		12		-24	200
1942	53	110	18		10		-18	170
1943	56	170	18		14		-18	240
1944	57	150	2		12		-18	200
1945	57	160	2		13		-30	200
1946	57	160	2		14		-30	200
1947	61	130	2		10		-18	190
1948	61	190	2		15		210	480
1949	61	230	2		16		240	550
1950	66	150	2		11		160	390
1951	67	160	2	100	11		290	630
1952	70	220	5	100	15		2250	2660
1953	72	180	5	100	11		1160	1520
1954	76	110	5	100	7		1170	1470
1955	80	220	5	100	14		2170	2590
1956	85	240	5	100	15		2580	3030
1957	88	240	5	100	15		2380	2830
1958	98	370	5	12	20		3280	3790
1959	100	270	26	12	15		2280	2710
1960	110	300	79	12	20		1990	2510
1961	110	430	91	12	29		2840	3520
1962	110	260	79	12	17		1400	1880
1963	120	280	110	12	17		1240	1780
1964	120	470	110	12	27		1840	2580
1965	140	320	140	17	16	18	1000	1650
1966	140	400	140	27	19	18	1130	1870
1967	140	380	140	32	18	18	800	1530
1968	150	430	140	25	19	20	910	1690
1969	160	420	140	20	18	22	760	1540
1970	170	440	150	40	20	27	680	1530
1971	180	630	210	40	25	29	870	1980
1972	180	530	210	45	30	32	660	1690
1973	180	550	140	45	30	34	590	1570
1974	180	420	180	45	23	36	490	1370

Water Use in Montana

A total of 672 (307 of which are on the Fort Peck Indian Reservation) projects in the basin that have existing water use were identified. The number and type of projects in each sub-basin is shown in Table A-6. The historical water use was identified on 61 irrigation projects, all of which are individually owned except for the four irrigators on Manternach Ditch. One municipal and 610 (290 of which are on the Fort Peck Indian Reservation) domestic projects were identified from aerial photographic maps which were prepared for the Water Resources Surveys of 1968, 1969, and 1970 (Water Resources Board 1968, 1969). Table A-7 shows 1052 acre-feet per year lost by evaporation from domestic reservoirs which is small in comparison to the 6,568 acre-feet per year used for irrigation. The locations of these projects are summarized in Table A-6 and are shown on the map in Figure 1.

Water use in the basin has varied annually because of (1) a general increase in irrigation, (2) variable annual precipitation and evaporation, and (3) variable annual runoff. At the 1975 level of development and assuming an average runoff year, the total water use in the basin would be 8,750 acre-feet as shown in Table A-7. Note that, except for Manternach Coulee, gravity and pumping irrigation water use occurred on the mainstems of the West Fork Poplar, Middle Fork Poplar, East Poplar and Poplar Rivers. Spreader dike irrigation projects have been developed only on the tributaries of these rivers.

Historical water use in the basin for the period 1931 to 1974 is given in Table A-8. Use varies from a minimum of 1,600 acre-feet in 1934 to a maximum of 8,590 acre-feet in 1972. The actual year of highest use was 1975 but is not included because the period of study was limited to 1931 to 1974. It is reflected, however, in the existing use studies. Summaries of historical water use by sub-basin are shown in Tables A-18 to A-34 of Attachment A-2. Irrigation demands in the basin have increased steadily since 1957 on the Middle Fork Poplar River and on the Poplar River. A more rapid increase has been noted since 1972.

Field interviews showed sprinkler irrigation has increased rapidly in the basin. The land owners located near the main streams are interested in sprinklers of the center pivot type. Water use demands may change as more sprinkler development is added.

Table A-6

NUMBER AND TYPES OF [illegible]

Sub-basin	Number of Projects				
	Domestic Reservoir	Irrigation			
		Gravity & Pumping	Sprinkler Dike	[illegible]	[illegible]
International Boundary to Fort Peck Indian Reservation Boundary					
10. Cow Creek	3	0	0	[illegible]	[illegible]
11. East Poplar River	22	3	[illegible]	[illegible]	[illegible]
12. Woodley Cr.	8	0	3	[illegible]	[illegible]
13. Middle Fork Poplar R.	11	6	[illegible]	[illegible]	[illegible]
14. Coal Creek	33	0	[illegible]	[illegible]	[illegible]
15. West Fork Poplar R.	158	3	2	[illegible]	163
16. Poplar	34	11	1	[illegible]	[illegible]
17. Butte Creek	46	[illegible]	3	[illegible]	[illegible]
18. Mantemach Coulee	5	3	1	[illegible]	[illegible]
19. Police Coulee	In West Fk. Total	0	3	[illegible]	[illegible]
SUB-TOTAL	320	26	18	[illegible]	[illegible]
Fort Peck Indian Reservation to Boundary					
20. Poplar R. To W. Fork	24	2	[illegible]	[illegible]	[illegible]
21. West Fork Poplar	33	1	1	[illegible]	[illegible]
22. Cottonwood Cr.	40	0	[illegible]	[illegible]	[illegible]
23. Police Coulee	3	0	1	[illegible]	[illegible]
24. Poplar, West Fork to USGS Gauge 6-1810	135	5	[illegible]	[illegible]	[illegible]
25. Poplar, USGS Gauge 6-1810 to Missouri R.	7	1	1	[illegible]	[illegible]
26. Box Elder Cr.	48	0	0	[illegible]	[illegible]
SUB-TOTAL	290	9	8	[illegible]	[illegible]
TOTALS	610	35	26	[illegible]	[illegible]

Table A-7

**EXISTING WATER USE - MONTANA
(acre-feet/year)

Sub-basin	Domestic		Irrigation				Municipal	Total
	Livestock Use	Reservoir Evap.	Gravity & Pumping		Spreader Dikes			
			Acres	AF	Ac.	AF		
International Boundary to Fort Peck Indian Reservation Boundary								
10. Cow Creek	10	4	0	0	0	0	0	14
11. East Poplar River	29	41	65	100	*530	441	0	611
12. Woodley Cr.	10	11	0	0	453	377	0	398
13. Middle Fork Poplar R.	44	~~47~~	1269	1950	0	0	0	2011
14. Coal Creek	34	27	0	0	31	26	0	87
15. West Fork Poplar R.	225	~~156~~	389	598	*208	175	0	1154
16. Poplar R.	64	~~61~~	976	1500	0	0	350	1975
17. Butte Cr.	64	121	0	0	197	164	0	349
18. Manternach Coulee	10	~~14~~	137	211	120	100	0	335
19. Police Coulee	In West Fk. Total	In West Fk. Total	0	0	189	157	0	157
SUB-TOTAL	490	452	2301 ~~2836~~	5400 ~~4350~~	1875 ~~1728~~	1562 ~~1440~~	350	7091
Fort Peck Indian Reservation to Boundary								
20. Poplar R. To W. Fork	17	37	250	384	47	39	0	477
21. West Fork Poplar	39	49	0	0	47	39	0	127
22. Cottonwood Cr.	51	62	0	0	0	0	0	113
23. Police Coulee	5	8	0	0	30	25	0	38
24. Poplar, West Fork to USGS Gauge 6-1810	124	334	~~10~~	15	221	184	0	657
25. Poplar, USGS Gauge 6-1810 to Missouri R.	8	6	46	71	14	12	0	97
26. Box Elder Cr.	46	104	0	0	0	0	0	150
SUB-TOTAL	290	600	306	470	359	299	0	1659
TOTAL	780	1052	3142	4829	2087	1739	350	8750

* Spreader dikes on tributaries

** Based on an average of 2.4 irrigations per season at 0.641 ac/ft for each irrigation.

Table A-8

HISTORICAL WATER USE - MONTANA
(acre-feet)

Year	Domestic Projects		Irrigation Projects		Municipal	Total
	Cattle Use	Res. Evap.	Spreader Dikes	Gravity or Pump Diversion		
1931	298	35	65	1298	100	1796
1932	304	39	65	2392	100	2900
1933	344	42	65	2188	100	2738
1934	391	55	65	993	100	1604
1935	344	72	65	2672	100	3253
1936	326	222	157	1577	100	2382
1937	275	540	157	690	100	1762
1938	265	567	157	1169	100	2258
1939	275	579	157	1449	100	2560
1940	285	590	196	1449	100	2620
1941	312	595	196	1449	100	2652
1942	352	604	196	1449	100	2701
1943	388	612	196	1931	100	3227
1944	427	619	196	1449	109	2800
1945	433	623	279	965	109	2409
1946	413	631	279	483	109	1915
1947	383	638	279	1449	109	2858
1948	394	651	279	1449	109	2882
1949	386	661	279	965	109	2400
1950	352	682	342	1537	116	3029
1951	375	689	342	1107	116	2629
1952	424	700	342	1152	116	2734
1953	449	706	342	2305	123	3925
1954	513	715	342	1730	123	3423
1955	537	725	369	1922	123	3676
1956	556	737	369	1922	130	3714
1957	512	755	394	1466	130	3257
1958	456	764	394	1053	130	2797
1959	403	772	394	1053	138	2760
1960	411	786	570	2557	138	4462
1961	444	799	1071	1403	138	3855
1962	449	819	1152	4214	145	6779
1963	513	862	1223	4242	152	6992
1964	622	893	1223	2832	152	5722
1965	638	922	1223	4127	195	7105
1966	670	934	1225	2794	195	5848
1967	704	950	1658	4198	232	7742
1968	727	965	1658	2557	246	6153
1969	679	979	1702	2777	246	6383
1970	689	999	1654	4440	253	8035
1971	659	1015	1714	2986	261	6635
1972	659	1030	1714	4922	261	8586
1973	694	1042	1679	3035	319	6769
1974	722	1051	1714	3295	348	7130

V. DISCUSSION

Differences in refinement of data, procedures, water right filings, and other factors have been noted throughout the report. The following discussions relate to these differences and their possible effects on the study results. Also included are discussions of the positions of Saskatchewan and Montana, including the Fort Peck Indian Tribes, on water rights and fisheries.

Methodology

There were some inconsistencies in methodology between the two countries due primarily to the availability of information. For instance, in Saskatchewan detailed plans of most projects were available in the water right files. On unregistered projects, information was obtained through field inspections. In Montana, the same extent of detailed information was largely unavailable. Physical characteristics of irrigation projects were obtained in field inspections. Surface area of domestic reservoirs was estimated by a sampling process using aerial photographs.

The method of estimating irrigation water use varied considerably. Saskatchewan relied heavily on project owner interviews and pumping records. There was evidence that actual applications generally fell short of actual crop requirements, in many cases due to an inadequate water supply. In Montana, a theoretical approach based on crop requirements and soil characteristics was used and it was assumed that crop requirements were met whenever water was available. Pumping records on a few projects generally supported this approach.

Water use on domestic projects in Saskatchewan and Montana were based on the same criteria, however, the method of obtaining livestock numbers varied considerably. Again, Saskatchewan relied on information obtained through project owner interviews for historical and present livestock numbers. Montana estimated livestock numbers based on county cattle inventories carried out in 1946 to 1974.

There are undoubtedly small errors in the results of the study due to the assumptions and approximations that were necessary to circumvent the paucity of basic data and to meet the time constraints for the study. It is felt, however, that the results provide a reasonable approximation of historical water use in the basin and are as accurate as possible considering the data limitations.

Using the results of this study in reconstructing natural flows would definitely be an improvement over ignoring upstream uses and assuming recorded flows are natural flows. They would also be an improvement over using the project allocations tabulated in the Environment Saskatchewan Water Rights Branch files and the Montana Water Rights files.

Water use records could be improved by instituting mandatory annual water use reports and by gauging reservoir elevations and project diversions. Project inspections on a regular basis to continually update information on water rights are also essential.

Water Rights

The terms of reference for the Poplar River Task Force did not call for a study of the relationship between water use and water rights within the Poplar River basin. However, the water rights situation in both Saskatchewan and Montana is briefly discussed so that the study on existing and historical use of water within the basin can be put in proper perspective.

Saskatchewan

Prior to 1931, water resources in Canada were administered by the Canadian government. The first Canadian law relating to the use of water for irrigation was established by The North-West Irrigation Act in 1894. Since 1931, the administration of water resources in Saskatchewan has been the responsibility of the province. At this time an Act respecting water rights was established and cited as The Water Rights Act.

In the Saskatchewan portion of the Poplar River basin there are a total of 161 registered projects for which use and licensed water rights have been confirmed in a 1975 field inspection program. In addition, 120 unregistered projects were identified during this study. Approximately one-half have an insignificant effect on the depletion of surface water. The remaining half are being followed up and licensed by the Province of Saskatchewan.

Montana

The total extent of water rights under Montana law is unclear as adjudication has not yet wholly quantified existing water rights, which include filed rights, permitted rights, and use rights.

In addition to water rights established under state law, the doctrine of federally reserved water rights has been judicially sanctioned by the Supreme Court of the United States. Under this doctrine, there exists federally reserved water rights to present and future uses within the Poplar River Basin, including Indian reserved water rights for the Fort Peck Indian Reservation. The Fort Peck Indian Reservation lies within about one third of the basin.

The following is a statement from the Bureau of Indian Affairs prepared in counsel with the Field Solicitor of the Department of the Interior regarding the concept of the United States federal reserved right to use water:

> The Tribes' right to the use of water held in trust by the United States is equitably owned and exercised by the Indian individuals and Indian tribes in connection with their reserved rights. United States v. Ahtanum Irrigation District, 236 F. 2d 321 (9th Cir., 1956); cert. denied 352 U.S. 988; 330 F 2d 897 (9th Cir., 1956); 338 F 2d 307 (9th Cir., 1964); cert. denied 381 U.S. 924. That water right extends to fulfillment of the purposes for which the Indian reservation was created including not only present uses but the reservation of water sufficient to fulfill the future requirements of the Indians. Arizona v. California (373 U.S. 546, 1963); Conrad Investment Company v. United States, 161 F. 2d 829, 832 (9th Cir. 1908). The purpose for which these reservations were created was at least to permit them to establish an agricultural economy with its related uses as set forth in Winters v. U.S. (207 U.S. 564, (1908) and Arizona v. California, supra. However, the purpose for which those reservations were created was generally more extensive than just irrigation uses. but to turn to any "arts of civilization". Winters, supra. It was to provide a permanent home for the Indians whereon they could establish communities, irrigate the irrigable acres, develop the minerals and other natural resources, and preserve the minimum flow of streams and existence of bodies of water in order to preserve today and throughout the future, regardless of when the water is actually put to beneficial use, the environment wherein they lived. It is the protection of this unique feature of the right to the use of water that differs substantially from state created water rights. The unique nature of the Federal Reserved Right of the Sovereign is tantamount to an existing use right and cannot be determined to be but a mere "probable" future use. These rights are "present perfected rights", Arizona v. California, supra. The measure of such vested rights must be given full consideration in weighing the validity of any apportionment negotiations.

The United States Section of the Task Force recognizes the existence of Federal Reserved rights both for federal agencies and for Indian Tribes. The State of Montana may not necessarily agree with the extent of the Federal Reserved rights discussed in the excerpt quoted above.

The Task Force notes that legal questions may exist relating to existing water rights or permits in the U.S. and Canada. It is the view of the Task Force that this is an internal matter to be resolved within the respective countries.

Fisheries

Quantities of water for fisheries were not shown in tables presented earlier in this report. This is because (1) such use is not consumptive and therefore is not a depletion of natural flow and, (2) minimum flows have not been established under law.

A number of preliminary studies on the fisheries of the Poplar River Basin have been initiated by the State of Montana Department of Fish and Game and include participation by the Environmental Protection Agency and the Montana Department of Health and Environmental Sciences. These studies are continuing but a number of preliminary conclusions can be drawn from the information now available.

The Poplar River is one of the better warm water sports fisheries streams in Montana. The stream supports a population of native game species such as walleye, northern pike and goldeye. Sampling in 1975 indicate that the walleye population is dominant and consist of resident fish, the numbers of which are not significantly affected by recruitment from the Missouri River fisheries. Smallmouth bass were introduced in 1967 and have established themselves in the lower part of the basin. Rainbow trout have also been introduced recently but no population statistics are available. This sports fishery has received little statewide recognition due to relatively sparce human population resident in the basin.

It is not known with certainty, but it appears that the sport fisheries do not extend into Canada, since the flows at the international boundary are low or intermittent during most of the season. The importance the upper portion of the basin plays in spawning of resident fish populations is presently unknown.

Although Montana contains many prairie streams, few provide a sport fishery. While habitat in the Poplar River is now of sufficient quality to maintain a sport fishery, a narrow margin separates this river from numerous other streams which contain only non-game species. Basin developments which would reduce water quantity or quality could result in habitat changes which could be detrimental to desirable game fish species.

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ATTACHMENT A-1

HISTORICAL WATER USE IN SASKATCHEWAN STATISTICAL DATA BY SUB-BASIN

ATTACHMENT A-1

LIST OF TABLES

Table A-9

HISTORICAL WATER USE IN SASKATCHEWAN
COW CREEK, SUB-BASIN 1
(acre-feet)

Year	Domestic Projects		Irrigation Projects			Total
			Use			
	Use	Evap.	Backflood	Sprinkler or Gravity	Evap.	
1931						
1932						
1933						
1934						
1935						
1936						
1937	3	8				11
1938	3	3	2		1	9
1939	3	6	2		1	12
1940	3	4	2		1	10
1941	3	4	2		1	10
1942	3	3	2		1	9
1943	3	5	2		1	11
1944	3	4	2		1	10
1945	3	6	2		1	12
1946	3	6	2		1	12
1947	3	5	2		1	11
1948	3	7	2		1	13
1949	3	8	2		1	14
1950	4	5	2		1	12
1951	4	6	2		1	13
1952	4	8	2		1	15
1953	4	6	2		1	13
1954	4	4	2		1	11
1955	4	7	2		1	14
1956	5	10	2		1	18
1957	5	10	2		1	18
1958	5	14	2		1	22
1959	6	12	2		1	21
1960	6	12	2		1	21
1961	6	18	2		2	28
1962	6	10	2		1	19
1963	6	10	2		1	19
1964	6	17	2		1	26
1965	6	11	2		1	20
1966	7	15	2		1	25
1967	7	14	2		1	24
1968	7	15	2		1	25
1969	8	15				23
1970	8	15				23
1971	8	22				30
1972	8	18				26
1973	8	19				27
1974	8	14				22

Table A-10

HISTORICAL WATER USE IN SASKATCHEWAN
EAST POPLAR RIVER, SUB-BASIN 2
(acre-feet)

Year	Domestic Projects		Irrigation Projects			Clark Bridge Reservoir Evap.	Total
			Use				
	Use	Evap.	Backflood	Sprinkler or Gravity	Evap.		
1931							
1932							
1933							
1934							
1935	1						1
1936	1	4					5
1937	4	16					20
1938	8	13					21
1939	10	27			3		40
1940	15	24			2		41
1941	19	36			2		57
1942	19	26			2		47
1943	19	41			3		63
1944	19	37			2		58
1945	19	38			2		59
1946	19	39			3		61
1947	19	34			2		55
1948	19	48			3		70
1949	19	59			3		81
1950	20	41			2		63
1951	20	42			2	130	190
1952	20	58			3	180	260
1953	22	48			2	140	210
1954	22	29			1	80	130
1955	22	58			3	160	240
1956	22	62		2	3	170	260
1957	23	62		2	3	170	260
1958	23	96		2	4	240	360
1959	23	69		2	3	180	280
1960	23	73		2	3	190	290
1961	24	110		2	4	270	410
1962	25	67		2	3	160	260
1963	25	68	19	2	3	160	280
1964	25	110	19	2	4	250	410
1965	25	74	19	2	0	160	280
1966	24	89	19	2	0	200	330
1967	24	85	19	2	0	80	210
1968	24	94	19	2	0	100	240
1969	24	90	19	2	0	90	230
1970	24	90	19	2	0	90	220
1971	24	130	59	2	0	130	340
1972	24	110	59	2	0	110	300
1973	24	110	59	2	0	110	310
1974	24	86	59	2	0	80	250

Table A-11

HISTORICAL WATER USE IN SASKATCHEWAN
GIRARD CREEK, SUB-BASIN 3
(acre-feet)

Year	Domestic Projects		Irrigation Projects			Municipal Water Use	Coronach Reservoir Evap.	Total
			Use					
	Use	Evap.	Back flood	Sprinkler or Gravity	Evap.			
1931								
1932								
1933								
1934								
1935								
1936								
1937	4	29						33
1938	7	37						44
1939	8	66			10			84
1940	8	52			8			68
1941	8	51			8			67
1942	8	37			6			51
1943	11	60			8			79
1944	11	55			8			74
1945	11	56			8			75
1946	11	57			8			76
1947	11	46			6			63
1948	11	64			9		210	290
1949	11	75			10		250	350
1950	11	49			7		160	230
1951	11	51		100	7		160	330
1952	11	69		100	9		220	410
1953	11	55		100	7		180	350
1954	11	34		100	4		110	260
1955	11	67		100	8		190	380
1956	12	73		100	9		210	400
1957	12	73		100	9		200	390
1958	14	110		10	13		310	460
1959	14	77		10	9		220	330
1960	15	85		10	10		230	350
1961	15	120		10	14		330	490
1962	15	72		10	8		190	300
1963	16	91		10	8		200	330
1964	16	150		10	13		320	510
1965	16	95		10	9	18	200	350
1966	16	120		10	11	18	260	440
1967	16	110		15	10	18	250	420
1968	15	130		8	11	20	270	450
1969	15	120		3	11	22	260	430
1970	19	120		3	11	27	260	440
1971	20	170		3	15	29	360	600
1972	20	140		3	13	32	310	520
1973	20	150		3	13	34	310	530
1974	20	110		3	10	36	250	430

Table A-12

HISTORICAL WATER USE IN SASKATCHEWAN
FIFE LAKE, SUB-BASIN 6
(acre-feet)

Year	Domestic Projects		Irrigation Projects			Fife Lake Evap.	Total
			Use				
	Use	Evap.	Backflood	Sprinkler or Gravity	Evap.		
1931							
1932							
1933							
1934							
1935	5	3	16		1		20
1936	10	12	16		3	-11	30
1937	10	16	16		2	-34	10
1938	10	9	16		1	-6	30
1939	11	16	16		2	-18	30
1940	11	13	16		1	-18	23
1941	11	13	16		1	-24	20
1942	11	10	16		1	-18	20
1943	11	15	16		2	-18	30
1944	11	13	0		1	-18	10
1945	11	14	0		2	-28	0
1946	11	14	0		2	-40	10
1947	15	13	0		1	-18	10
1948	15	22	0		2	0	40
1949	15	28	0		2	-6	40
1950	15	18	0		1	0	30
1951	16	20	0		1	0	40
1952	16	27	3		2	1850	1900
1953	16	21	3		1	840	880
1954	16	13	3		1	980	1010
1955	16	26	3		2	1820	1870
1956	18	32	3		2	2200	2260
1957	18	31	3		2	1980	2030
1958	20	53	3		2	2660	2740
1959	22	38	16		2	1830	1910
1960	26	43	64		6	1510	1650
1961	26	64	64		9	2180	2330
1962	26	37	64		5	1000	1130
1963	32	40	64		5	750	890
1964	32	65	64		9	1080	1250
1965	34	43	92	5	6	530	710
1966	35	56	92	15	7	530	740
1967	35	53	92	15	8	340	540
1968	37	64	92	15	7	280	500
1969	47	70	92	15	7	150	380
1970	47	71	92	15	7	80	310
1971	51	110	92	15	10	60	340
1972	51	90	92		17	-20	230
1973	51	92	19		17	-50	130
1974	51	73	64		13	-80	120

Table A-13

HISTORICAL WATER USE IN SASKATCHEWAN
POPLAR RIVER, SUB-BASIN 5
(acre-feet)

Year	Domestic Projects		Irrigation Projects			Total
			Use			
	Use	Evap.	Backflood	Sprinkler or Gravity	Evap.	
1931	2	9				11
1932	2	7				9
1933	2	7				9
1934	2	12				14
1935	2	6				8
1936	2	11				13
1937	3	14				17
1938	3	6				9
1939	4	31				35
1940	6	25				31
1941	6	25				31
1942	6	18				24
1943	6	28				34
1944	7	25				32
1945	7	26				33
1946	7	27				34
1947	7	21				28
1948	7	30				37
1949	7	35				42
1950	10	24				34
1951	10	26				36
1952	10	36				46
1953	10	28				38
1954	12	17				29
1955	13	34				47
1956	14	38				52
1957	16	39				55
1958	22	60				82
1959	22	42				64
1960	23	46				69
1961	24	68				92
1962	24	39				63
1963	24	40				64
1964	26	72				98
1965	37	57				94
1966	37	72				110
1967	39	70				110
1968	39	77				120
1969	43	78				120
1970	44	81	12	20		160
1971	47	120	12	20		200
1972	48	100	12	40		200
1973	48	110	12	40		210
1974	48	83	12	40		180

Table A-14

HISTORICAL WATER USE IN SASKATCHEWAN
COAL CREEK, SUB-BASIN 6
(acre-feet)

Year	Domestic Projects		Irrigation Projects			Total
			Use			
	Use	Evap.	Backflood	Sprinkler or Gravity	Evap.	
1931						
1932						
1933						
1934						
1935						
1936						
1937						
1938						
1939						
1940						
1941						
1942						
1943						
1944						
1945						
1946						
1947						
1948						
1949						
1950						
1951						
1952						
1953						
1954						
1955	3	1				4
1956	3	1				4
1957	3	1				4
1958	3	2				5
1959	3	2				5
1960	3	2				5
1961	3	2				5
1962	3	2				5
1963	3	2				5
1964	3	4				7
1965	5	4				9
1966	5	5				10
1967	5	5				10
1968	5	6				11
1969	5	5				10
1970	5	5				10
1971	5	8				13
1972	5	6				11
1973	5	7				12
1974	5	5				10

Table A-15

HISTORICAL WATER USE IN SASKATCHEWAN
WEST POPLAR RIVER EAST TRIBUTARY, SUB-BASIN 7
(acre-feet)

Year	Domestic Projects		Irrigation Projects			Total
			Use			
	Use	Evap.	Backflood	Sprinkler or Gravity	Evap.	
1931						
1932						
1933						
1934						
1935						
1936						
1937						
1938						
1939						
1940						
1941						
1942						
1943						
1944						
1945						
1946						
1947						
1948						
1949						
1950						
1951						
1952	3	1				4
1953	3	1				4
1954	3	1				4
1955	3	1				4
1956	3	1				4
1957	3	1				4
1958	3	2				5
1959	4	2	8			14
1960	4	2	13			19
1961	4	2	13			19
1962	4	1	13			18
1963	4	1	13			18
1964	4	2	13			19
1965	4	1	13			18
1966	4	2	13			19
1967	6	2	13			21
1968	6	2	13			21
1969	6	2	13			21
1970	8	2	13			23
1971	8	2	13			23
1972	8	2	13			23
1973	8	2	13			23
1974	8	2	13			23

Table A-16

HISTORICAL WATER USE IN SASKATCHEWAN
WEST POPLAR RIVER, SUB-BASIN 8
(acre-feet)

Year	Domestic Projects		Irrigation Projects			West Poplar Reservoir Evap.	Total
			Use				
	Use	Evap.	Backflood	Sprinkler or Gravity	Evap.		
1931							
1932							
1933							
1934							
1935							
1936							
1937	5	1					6
1938	5	0					5
1939	5	5					10
1940	5	4					9
1941	5	4					9
1942	5	3					8
1943	5	4					9
1944	5	4					9
1945	5	4					9
1946	5	4					9
1947	5	3					8
1948	5	4					9
1949	5	5					10
1950	5	3					8
1951	5	5					10
1952	5	4					9
1953	5	3					8
1954	7	3					10
1955	7	6					13
1956	7	8					15
1957	7	8				30	45
1958	7	11				72	90
1959	7	8				54	69
196-	9	10				60	79
1961	9	15	12			60	96
1962	9	9	0			48	66
1963	9	9	12			130	160
1964	9	15	0			190	210
1965	11	10	12			110	[illegible]
1966	11	12	12			140	180
1967	11	12	12			130	170
1968	11	14	12			260	300
1969	13	17	12			260	300
1970	16	23	12			250	300
1971	16	32	12			320	380
1972	16	27	12			260	320
1973	16	28	12			220	280
1974	16	21	12			240	290

Table A-17

HISTORICAL WATER USE IN SASKATCHEWAN
OTHER TRIBUTARIES, SUB-BASIN 9
(acre-feet)

Year	Domestic Projects		Irrigation Projects			
			Use			
	Use	Evap.	Backflood	Sprinkler or Gravity	Evap.	Total
1931						
1932						
1933						
1934						
1935						
1936						
1937	1	19				20
1938	1	9				10
1939	1	15				16
1940	1	12				13
1941	1	11				12
1942	1	8				9
1943	1	13				14
1944	1	11				12
1945	1	12				13
1946	1	12				13
1947	1	9				10
1948	1	13				14
1949	1	15				16
1950	1	10				11
1951	1	10				11
1952	1	17				18
1953	1	14				15
1954	1	8				9
1955	1	17				18
1956	1	18				19
1957	1	18				19
1958	1	26				27
1959	1	22				23
1960	1	24				25
1961	1	35				36
1962	1	20				21
1963	1	20				21
1964	1	33				34
1965	2	22				24
1966	2	28				30
1967	2	26				28
1968	2	29				31
1969	2	28				30
1970	2	28				30
1971	2	39	20			61
1972	2	33	20			55
1973	2	34	20			56
1974	2	26	20			48

ATTACHMENT A-2

HISTORICAL WATER USE IN MONTANA STATISTICAL DATA BY SUB-BASIN

LIST OF TABLES

Table A-18

HISTORICAL WATER USE IN MONTANA
COW CREEK, SUB-BASIN 10
(acre-feet)

Year	Domestic Projects		Irrigation Projects		Municipal	Total
	Cattle Use	Res. Evap.	Spreader Dikes	Gravity or Pump Diversion		
1931	3	0				3
1932	3	0				3
1933	4	0				4
1934	4	0				4
1935	4	0				4
1936	3	3				6
1937	2	3				5
1938	2	4				6
1939	2	4				6
1940	2	4				6
1941	3	4				7
1942	4	4				8
1943	4	4				8
1944	5	4				9
1945	5	4				9
1946	5	4				9
1947	4	4				8
1948	4	4				8
1949	4	4				8
1950	4	4				8
1951	4	4				8
1952	5	4				9
1953	5	4				9
1954	6	4				10
1955	6	4				10
1956	6	4				10
1957	6	4				10
1958	5	4				9
1959	4	4				8
1960	5	4				9
1961	5	4				9
1962	5	4				9
1963	6	4				10
1964	7	4				11
1965	7	4				11
1966	8	4				12
1967	8	4				12
1968	8	4				12
1969	8	4				12
1970	8	4				12
1971	7	4				11
1972	7	4				11
1973	8	4				12
1974	9	4				13

Table A-19

HISTORICAL WATER USE IN MONTANA
EAST POPLAR RIVER, SUB-BASIN 11
(acre-feet)

Year	Domestic Projects		Irrigation Projects		Municipal	Total
	Cattle Use	Res. Evap.	Spreader Dikes	Gravity or Pump Diversion		
1931	8	0				9
1932	8	1				9
1933	11	1				12
1934	14	1				15
1935	11	4				15
1936	9	6				15
1937	6	9				15
1938	6	10				16
1939	6	10				16
1940	7	10				16
1941	8	10				18
1942	11	10				21
1943	13	10				23
1944	15	10				25
1945	16	10				26
1946	14	11				25
1947	12	11				23
1948	12	11				23
1949	13	11				24
1950	11	11				22
1951	13	11				24
1952	14	11				25
1953	15	12				27
1954	18	12				30
1955	19	12				31
1956	19	12				31
1957	18	12	25	45		100
1958	16	14	25	90		145
1959	13	14	25	64		116
1960	14	14	25	128		181
1961	15	14	25	64		118
1962	15	14	25	192		246
1963	18	14	25	192		249
1964	21	14	25	128		188
1965	22	28	25	125		200
1966	22	28	57	83		190
1967	24	30	385	125		564
1968	25	32	385	83		525
1969	23	32	429	83		567
1970	24	36	381	125		566
1971	22	36	441	83		582
1972	22	38	441	125		626
1973	24	38	406	125		593
1974	26	40	441	83		590

Table A-20

HISTORICAL WATER USE IN MONTANA
WOODLEY CREEK, SUB-BASIN 12
(acre-feet)

Year	Domestic Projects		Irrigation Projects		Municipal	Total
	Cattle Use	Res. Evap.	Spreader Dikes	Gravity or Pump Diversion		
1931	3	0				3
1932	3	1				4
1933	4	1				5
1934	4	3				7
1935	4	3				7
1936	3	3				6
1937	2	3				5
1938	2	4				6
1939	2	7				9
1940	2	9				11
1941	3	9				12
1942	4	9				13
1943	4	9				13
1944	5	9				14
1945	5	9				14
1946	5	9				14
1947	4	9				13
1948	4	9				13
1949	4	9				13
1950	4	9				13
1951	4	9				13
1952	5	9				14
1953	5	9				14
1954	6	9				15
1955	6	9				15
1956	6	9				15
1957	6	9				15
1958	5	9				14
1959	4	9				13
1960	5	9	133			147
1961	5	9	372			386
1962	5	9	377			391
1963	6	9	377			392
1964	7	10	377			394
1965	7	10	377			394
1966	8	10	377			395
1967	8	11	377			396
1968	8	11	377			396
1969	8	11	377			396
1970	8	11	377			396
1971	7	11	377			395
1972	7	11	377			395
1973	8	11	377			396
1974	9	11	377			397

Table A-21

HISTORICAL WATER USE IN MONTANA
MIDDLE FORK POPLAR RIVER, SUB-BASIN 15
(acre-feet)

Year	Domestic Projects		Irrigation Projects		Municipal	Total
	Cattle Use	Res. Evap.	Spreader Dikes	Gravity or Pump Diversion		
1931	12	0		187		199
1932	12	0		374		386
1933	16	0		374		390
1934	20	2		187		209
1935	16	2		562		580
1936	14	3		374		391
1937	9	4		190		203
1938	8	5		374		387
1939	9	5		562		576
1940	10	5		562		577
1941	12	5		562		579
1942	16	5		562		583
1943	19	5		749		773
1944	23	5		562		590
1945	23	5		374		402
1946	21	5		187		213
1947	17	5		562		584
1948	18	5		562		585
1949	19	5		374		398
1950	17	5		562		584
1951	19	5		374		398
1952	22	5		374		401
1953	22	5		749		776
1954	27	5		562		594
1955	28	5		658		691
1956	29	5		658		692
1957	27	6		438		471
1958	24	6		219		249
1959	19	6		219		244
1960	20	6		438		464
1961	23	6		280		309
1962	23	6		840		868
1963	26	13		840		879
1964	32	13		560		605
1965	33	13		840		886
1966	34	13		560		607
1967	36	15		840		891
1968	37	15		765		817
1969	34	15		1022		1071
1970	36	16		1754		1806
1971	33	16		1169		1218
1972	33	16		1913		1962
1973	36	17		1276		1329
1974	39	17		1276		1332

Table A-22
HISTORICAL WATER USE IN MONTANA
COAL CREEK, SUB-BASIN 14
(acre-feet)

Year	Domestic Projects		Irrigation Projects		Municipal	Total
	Cattle Use	Res. Evap.	Spreader Dikes	Gravity or Pump Diversion		
1931	9	1	26			36
1932	10	1	26			37
1933	12	2	26			40
1934	16	2	26			44
1935	12	3	26			41
1936	11	6	26			43
1937	7	8	26			41
1938	7	8	26			41
1939	7	8	26			41
1940	8	8	26			42
1941	10	9	26			45
1942	12	9	26			47
1943	15	9	26			50
1944	18	9	26			53
1945	18	9	26			53
1946	16	9	26			51
1947	14	9	26			49
1948	14	11	26			51
1949	15	11	26			52
1950	13	12	26			51
1951	15	12	26			53
1952	17	12	26			55
1953	17	12	26			55
1954	21	12	26			59
1955	22	13	26			61
1956	23	13	26			62
1957	21	13	26			60
1958	19	13	26			58
1959	15	13	26			54
1960	16	13	26			55
1961	18	15	26			59
1962	18	16	26			60
1963	20	16	26			62
1964	24	17	26			67
1965	26	19	26			71
1966	26	20	26			72
1967	28	21	26			75
1968	29	22	26			77
1969	27	24	26			77
1970	28	25	26			79
1971	26	27	26			79
1972	26	27	26			79
1973	28	27	26			81
1974	30	27	26			83

Table A-25
HISTORICAL WATER USE IN MONTANA
WEST FORK POPLAR RIVER OUTSIDE RESERVATION, SUB-BASIN 15
(acre-feet)

Year	Domestic Projects		Irrigation Projects		Municipal	Total
	Cattle Use	Res. Evap.	Spreader Dikes	Gravity or Pump Diversion		
1931	60	1		74		135
1932	63	2		147		212
1933	81	4		147		232
1934	104	8		74		186
1935	81	11		221		313
1936	72	28		147		247
1937	48	40		74		162
1938	43	55		147		245
1939	48	55		221		324
1940	53	58		221		332
1941	63	58		221		342
1942	81	59		221		361
1943	99	59		295		453
1944	116	60		221		397
1945	119	60		147		326
1946	105	60		74		239
1947	89	60		221		370
1948	94	61		221		376
1949	96	63		147		306
1950	87	68		221		376
1951	96	71		147		314
1952	110	72		147		329
1953	115	73		295		483
1954	137	74		221		432
1955	144	77	27	221		469
1956	149	78	27	221		475
1957	138	81	27	147		393
1958	122	82	27	74		305
1959	102	83	27	74		286
1960	104	87	27	147		365
1961	118	91	27	74		310
1962	116	96	27	221		460
1963	134	102	98	221		555
1964	161	118	98	147		524
1965	169	122	98	221		610
1966	172	126	98	147		543
1967	184	129	173	221		707
1968	190	134	173	147		644
1969	175	137	173	147		632
1970	185	140	173	221		719
1971	171	145	173	147		636
1972	171	150	173	221		715
1973	186	153	173	147		659
1974	198	156	173	147		674

Table A-24

HISTORICAL WATER USE IN MONTANA
POPLAR RIVER OUTSIDE RESERVATION, SUB-BASIN 16
(acre-feet)

Year	Domestic Projects		Irrigation Projects		Municipal	Total
	Cattle Use	Res. Evap.	Spreader Dikes	Gravity or Pump Diversion		
1931	17	0		177	100	294
1932	18	2		354	100	474
1933	23	2		354	100	479
1934	29	5		177	100	311
1935	23	7		531	100	661
1936	20	16		354	100	490
1937	14	21		177	100	312
1938	12	21		354	100	487
1939	14	23		531	100	668
1940	15	23		531	100	669
1941	18	23		531	100	672
1942	23	23		531	100	677
1943	28	23		708	100	859
1944	33	23		531	109	696
1945	34	23		354	109	520
1946	30	23		177	109	339
1947	25	23		531	109	688
1948	27	25		531	109	692
1949	27	25		354	109	515
1950	25	29		531	116	701
1951	27	29		354	116	526
1952	31	29		354	116	530
1953	32	29		708	123	892
1954	39	30		531	123	723
1955	41	30		531	123	725
1956	42	30		531	130	733
1957	39	32		495	130	696
1958	35	32		275	130	472
1959	29	32		301	138	500
1960	30	34		797	138	999
1961	33	34		401	138	606
1962	33	36		1208	145	1422
1963	38	38		1213	152	1441
1964	46	39		812	152	1049
1965	48	39		1223	195	1505
1966	49	41		819	195	1104
1967	52	41		1235	232	1560
1968	54	43		826	246	1169
1969	50	45		828	246	1169
1970	52	50		1296	253	1651
1971	48	54		941	261	1304
1972	48	56		1754	261	2119
1973	53	59		867	319	1298
1974	56	61		1169	348	1634

Table A-25

HISTORICAL WATER USE IN MONTANA
BUTTE CREEK, SUB-BASIN 17
(acre-feet)

Year	Domestic Projects		Irrigation Projects		Municipal	Total
	Cattle Use	Res. Evap.	Spreader Dikes	Gravity or Pump Diversion		
1931	17	2				19
1932	18	2				20
1933	23	2				25
1934	29	4				33
1935	23	9				32
1936	20	24				44
1937	14	31				45
1938	12	33				45
1939	14	35				49
1940	15	35				50
1941	18	35				53
1942	23	35				58
1943	28	35				63
1944	33	35				68
1945	34	35				69
1946	30	35				65
1947	25	37				62
1948	27	37				64
1949	27	40				67
1950	25	42				67
1951	27	42				69
1952	31	46				77
1953	32	46				78
1954	39	46				85
1955	41	46				87
1956	42	48				90
1957	39	51				90
1958	35	51				86
1959	29	53				82
1960	30	55				85
1961	33	57	164			254
1962	33	59	164			256
1963	38	83	164			285
1964	46	88	164			298
1965	48	90	164			302
1966	49	90	164			303
1967	52	92	164			308
1968	54	94	164			312
1969	50	97	164			311
1970	52	103	164			319
1971	48	108	164			320
1972	48	114	164			326
1973	53	119	164			336
1974	56	121	164			341

Table A-26

HISTORICAL WATER USE IN MONTANA
MANTERNACH COULEE, SUB-BASIN 18
(acre-feet)

Year	Domestic Projects		Irrigation Projects		Municipal	Total
	Cattle Use	Res. Evap.	Spreader Dikes	Gravity or Pump Diversion		
1931	3	0				3
1932	3	0				3
1933	4	0				4
1934	5	0				5
1935	4	3				7
1936	3	3				6
1937	2	3				5
1938	2	3				5
1939	2	3				5
1940	2	3				5
1941	3	3				6
1942	4	3				7
1943	4	3				7
1944	5	3				8
1945	5	3	83			91
1946	5	3	83			91
1947	4	3	83			90
1948	4	3	83			90
1949	4	3	83			90
1950	4	3	83			90
1951	4	3	83	38		128
1952	5	3	83	38		129
1953	5	3	83	77		168
1954	6	3	83	58		150
1955	7	3	83	58		150
1956	6	6	83	58		154
1957	6	8	83	38		135
1958	5	8	83	19		115
1959	4	8	83	19		114
1960	5	8	83	38		134
1961	5	8	83	80		176
1962	5	8	100	240		353
1963	6	8	100	263		377
1964	7	8	100	176		291
1965	7	8	100	263		378
1966	8	8	100	176		292
1967	8	11	100	263		382
1968	8	14	100	176		298
1969	8	14	100	176		298
1970	8	14	100	263		385
1971	7	14	100	176		297
1972	7	14	100	263		384
1973	8	14	100	176		298
1974	9	14	100	176		299

Table A-27

HISTORICAL WATER USE IN MONTANA
POLICE COULEE OUTSIDE RESERVATION, SUB-BASIN 17
(acre-feet)

Year	Domestic Projects		Irrigation Projects		Municipal	Total
	Cattle Use	Res. Evap.	Spreader Dikes	Gravity or Pump Diversion		
1931						
1932						
1933						
1934						
1935						
1936						
1937						
1938						
1939						
1940						
1941						
1942						
1943						
1944						
1945						
1946						
1947						
1948						
1949						
1950						
1951						
1952						
1953						
1954						
1955						
1956						
1957						
1958						
1959						
1960						
1961			98			98
1962			157			157
1963			157			157
1964			157			157
1965			157			157
1966			157			157
1967			157			157
1968			157			157
1969			157			157
1970			157			157
1971			157			157
1972			157			157
1973			157			157
1974			157			157

Table A-28

HISTORICAL WATER USE IN MONTANA
POPLAR RIVER WITHIN RESERVATION, SUB-BASIN 20
(acre-feet)

Year	Domestic Projects		Irrigation Projects		Municipal	Total
	Cattle Use	Res. Evap.	Spreader Dikes	Gravity or Pump Diversion		
1931	9	2	0	0		11
1932	9	2		0		11
1933	9	2		0		11
1934	9	2		0		11
1935	9	2		0		11
1936	9	8		0		17
1937	9	26		0		35
1938	9	26		0		35
1939	9	26	0	0		35
1940	9	27	39	0		75
1941	10	27	39	0		76
1942	10	27	39	0		76
1943	10	29	39	0		78
1944	10	29	39	0		78
1945	10	29	39	0		78
1946	10	29	39	0		78
1947	10	29	39	0		78
1948	11	30	39	0		80
1949	10	30	39	0		79
1950	9	31	39	0		79
1951	9	31	39	0		79
1952	10	31	39	0		80
1953	11	31	39	0		81
1954	12	32	39	0		83
1955	13	32	39	96		180
1956	13	32	39	96		180
1957	12	34	39	64		149
1958	11	34	39	32		116
1959	10	34	39	32		115
1960	10	34	39	321		404
1961	10	35	39	160		244
1962	11	35	39	481		566
1963	12	35	39	481		567
1964	16	37	39	321		413
1965	16	37	39	481		573
1966	17	37	39	321		414
1967	17	37	39	481		574
1968	17	37	39	321		414
1969	17	37	39	321		414
1970	16	37	39	481		573
1971	17	37	39	321		414
1972	17	37	39	481		574
1973	17	37	39	321		414

Table A-29

HISTORICAL WATER USE IN MONTANA
WEST FORK POPLAR RIVER WITHIN RESERVATION, SUB-BASIN 71
(acre-feet)

Year	Domestic Projects		Irrigation Projects		Municipal	Total
	Cattle Use	Res. Evap.	Spreader Dikes	Gravity or Pump Diversion		
1931	22	3	39	0		64
1932	22	3	39	0		64
1933	22	3	39	0		64
1934	22	3	39	0		64
1935	22	3	39	0		64
1936	23	11	39	0		73
1937	23	34	39	0		96
1938	23	35	39	0		97
1939	23	35	39	0		97
1940	23	35	39	0		97
1941	24	36	39	0		99
1942	24	36	39	0		99
1943	24	38	39	0		101
1944	24	38	39	0		101
1945	24	38	39	0		101
1946	25	39	39	0		103
1947	26	39	39	0		104
1948	26	39	39	0		104
1949	24	40	39	0		103
1950	22	40	39	0		101
1951	22	41	39	0		102
1952	25	41	39	90		195
1953	27	41	39	179		286
1954	29	43	39	135		246
1955	30	43	39	135		247
1956	32	43	39	135		249
1957	29	44	39	90		202
1958	26	44	39	45		154
1959	25	45	39	45		154
1960	25	45	39	90		199
1961	26	45	39	45		155
1962	27	47	39	135		248
1963	30	47	39	135		251
1964	37	57	39	90		213
1965	37	48	39	77		201
1966	40	48	39	51		178
1967	41	49	39	77		206
1968	42	49	39	51		181
1969	40	49	39	51		179
1970	39	49	39	77		204
1971	39	49	39	0		127
1972	39	49	39	77		204
1973	39	49	39	51		178
1974	39	49	39	51		178

Table A-30

HISTORICAL WATER USE IN MONTANA
COTTONWOOD CREEK, SUB-BASIN 22
(acre-feet)

Year	Domestic Projects		Irrigation Projects		Municipal	Total
	Cattle Use	Res. Evap.	Spreader Dikes	Gravity or Pump Diversion		
1931	29	3	0	0		32
1932	29	3	0	0		32
1933	29	3	0	0		32
1934	29	3	0	0		32
1935	29	3	0	0		32
1936	30	13	0	0		43
1937	30	43	0	0		73
1938	30	44	0	0		74
1939	30	44	0	0		74
1940	30	45	0	0		75
1941	30	45	0	0		75
1942	30	47	0	0		77
1943	30	47	0	0		77
1944	30	48	0	0		78
1945	30	48	0	0		78
1946	32	49	0	0		81
1947	33	49	0	0		82
1948	33	51	0	0		84
1949	31	51	0	0		82
1950	29	52	0	0		81
1951	29	52	0	0		81
1952	32	53	0	0		85
1953	35	53	0	0		88
1954	38	53	0	0		91
1955	40	54	0	0		94
1956	41	56	0	0		97
1957	38	56	0	0		94
1958	33	57	0	0		90
1959	32	57	0	0		89
1960	32	58	0	0		90
1961	33	58	0	0		91
1962	34	60	0	0		94
1963	39	60	0	0		99
1964	48	61	0	0		109
1965	48	61	0	0		109
1966	52	62	0	0		114
1967	53	62	0	0		115
1968	55	62	0	0		117
1969	52	62	0	0		114
1970	51	62	0	0		113
1971	51	62	0	0		113
1972	51	62	0	0		113
1973	51	62	0	0		113
1974	51	62	0	0		113

Table A-31

HISTORICAL WATER USE IN MONTANA
POLICE COULEE WITHIN RESERVATION, SUB-BASIN 23
(acre-feet)

Year	Domestic Projects		Irrigation Projects		Municipal	Total
	Cattle Use	Res. Evap.	Spreader Dikes	Gravity or Pump Diversion		
1931	3	0	0	0		3
1932	3	0	0	0		3
1933	3	0	0	0		3
1934	3	0	0	0		3
1935	3	0	0	0		3
1936	3	2	25	0		30
1937	3	5	25	0		33
1938	3	5	25	0		33
1939	3	5	25	0		33
1940	3	5	25	0		33
1941	3	5	25	0		33
1942	3	5	25	0		33
1943	3	5	25	0		33
1944	3	5	25	0		33
1945	3	5	25	0		33
1946	3	5	25	0		33
1947	3	5	25	0		33
1948	3	7	25	0		35
1949	3	7	25	0		35
1950	3	7	25	0		35
1951	3	7	25	0		35
1952	3	7	25	0		35
1953	3	7	25	0		35
1954	3	7	25	0		35
1955	3	7	25	0		35
1956	4	7	25	0		36
1957	3	7	25	0		35
1958	3	7	25	0		35
1959	3	7	25	0		35
1960	3	8	25	0		36
1961	3	8	25	0		36
1962	3	8	25	0		36
1963	3	8	25	0		36
1964	4	8	25	0		37
1965	4	8	25	0		37
1966	5	8	25	0		38
1967	5	8	25	0		38
1968	5	8	25	0		38
1969	5	8	25	0		38
1970	5	8	25	0		38
1971	5	8	25	0		38
1972	5	8	25	0		38
1973	5	8	25	0		38
1974	5	8	25	0		38

Table A-32

HISTORICAL WATER USE IN MONTANA
POPLAR RIVER, WEST FORK TO U.S.G.S. GAUGE, SUB-BASIN 24
(acre-feet)

Year	Domestic Projects		Irrigation Projects		Municipal	Total
	Cattle Use	Res. Evap.	Spreader Dikes	Gravity or Pump Diversion		
1931	72	17	0	860		949
1932	72	17	0	1517		1606
1933	72	17	0	1313		1402
1934	72	17	0	555		644
1935	72	17	0	1358		1447
1936	74	73	67	702		916
1937	74	233	67	249		623
1938	74	237	67	294		672
1939	74	241	67	135		517
1940	74	244	67	135		520
1941	75	246	67	135		523
1942	75	250	67	135		527
1943	75	254	67	179		575
1944	75	257	67	135		534
1945	75	260	67	90		492
1946	78	263	67	45		453
1947	82	267	67	135		551
1948	82	270	67	135		554
1949	75	273	67	90		505
1950	69	278	118	135		600
1951	72	280	118	135		605
1952	80	284	118	90		572
1953	87	288	118	179		672
1954	91	291	118	135		635
1955	96	293	118	135		642
1956	100	296	118	135		649
1957	90	299	118	90		597
1958	82	304	118	270		774
1959	80	306	118	270		774
1960	78	309	161	539		1087
1961	82	312	161	270		825
1962	85	317	161	809		1372
1963	95	321	161	809		1386
1964	116	323	161	539		1139
1965	116	328	161	809		1414
1966	125	330	161	578		1194
1967	131	332	161	868		1492
1968	135	332	161	129		757
1969	127	334	161	90		712
1970	123	334	161	135		753
1971	124	334	161	90		709
1972	124	334	161	0		619
1973	124	334	161	13		632
1974	124	334	161	13		632

HISTORICAL WATER USE IN MONTANA
POPLAR RIVER, U.S.G.S. GAUGE 6-1810 TO MOUTH, [illegible]-BASIN
(acre-feet)

Year	Domestic Projects		Irrigation Projects		Municipal	Total
	Cattle Use	Res. Evap.	Spreader Dikes	Gravity or Pump Diversion		
1931	4	0	0	0		[illegible]
1932	4	0	0	0		[illegible]
1933	4	0	0	0		[illegible]
1934	4	0	0	0		[illegible]
1935	4	0	0	0		[illegible]
1936	4	1	0	0		[illegible]
1937	4	4	0	0		[illegible]
1938	4	4	0	0		[illegible]
1939	4	4	0	0		[illegible]
1940	4	4	0	0		[illegible]
1941	4	4	0	0		[illegible]
1942	4	4	0	0		8
1943	4	4	0	0		8
1944	4	5	0	0		9
1945	4	5	0	0		[illegible]
1946	5	5	0	0		[illegible]
1947	5	5	0	0		[illegible]
1948	5	5	0	0		[illegible]
1949	5	5	0	0		10
1950	4	5	12	88		109
1951	4	5	12	59		80
1952	5	5	12	59		80
1953	5	5	12	118		140
1954	6	5	12	88		111
1955	6	6	12	88		[illegible]
1956	6	6	12	88		[illegible]
1957	6	6	12	59		83
1958	5	6	12	29		[illegible]
1959	5	6	12	29		[illegible]
1960	5	6	12	59		[illegible]
1961	5	6	12	29		[illegible]
1962	5	6	12	88		[illegible]
1963	6	6	12	88		112
1964	7	6	12	59		[illegible]
1965	7	6	12	88		[illegible]
1966	8	6	12	59		[illegible]
1967	8	6	12	88		[illegible]
1968	9	6	12	59		[illegible]
1969	8	6	12	59		[illegible]
1970	8	6	12	88		[illegible]
1971	8	6	12	59		85
1972	8	6	12	88		[illegible]
1973	8	6	12	59		[illegible]
1974	8	6	12	59		85

Table A-34

HISTORICAL WATER USE IN MONTANA
BOX ELDER CREEK, SUB-BASIN 26
(acre-feet)

Year	Domestic Projects		Irrigation Projects		Municipal	Total
	Cattle Use	Res. Evap.	Spreader Dikes	Gravity or Pump Diversion		
1931	27	5	0	0		32
1932	27	5	0	0		32
1933	27	5	0	0		32
1934	27	5	0	0		32
1935	27	5	0	0		32
1936	28	22	0	0		50
1937	28	73	0	0		101
1938	28	73	0	0		101
1939	28	74	0	0		102
1940	28	75	0	0		103
1941	28	76	0	0		104
1942	28	78	0	0		106
1943	28	78	0	0		106
1944	28	79	0	0		107
1945	28	80	0	0		108
1946	29	82	0	0		111
1947	30	83	0	0		113
1948	30	83	0	0		113
1949	29	84	0	0		113
1950	26	86	0	0		112
1951	27	87	0	0		114
1952	29	88	0	0		117
1953	32	88	0	0		120
1954	35	89	0	0		124
1955	36	91	0	0		127
1956	38	92	0	0		130
1957	34	93	0	0		127
1958	30	93	0	0		123
1959	29	95	0	0		124
1960	29	96	0	0		125
1961	30	97	0	0		127
1962	31	98	0	0		129
1963	36	98	0	0		134
1964	43	100	0	0		143
1965	43	101	0	0		144
1966	47	102	0	0		149
1967	49	102	0	0		151
1968	51	102	0	0		153
1969	47	104	0	0		151
1970	46	104	0	0		150
1971	46	104	0	0		150
1972	46	104	0	0		150
1973	46	104	0	0		150
1974	46	104	0	0		150